

topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

6. (amended) A system in accordance with Claim 5 wherein a topping heater fuel comprises a portion of said oxygen and hydrogen disassociated from said feed water in said high temperature water cracking system.

7. (amended) A system in accordance with Claim 5 further comprising a first regenerative heat exchanger and a topping heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct exhaust from said gas fired topping heater into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

8. (amended) A system in accordance with Claim 7 further comprising a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to a desalination plant to direct exhaust from said gas fired topping heater to said desalination plant after passing through said first regenerative heat exchanger.

9. (amended) A system in accordance with Claim 7 further comprising a second regenerative heat exchanger and a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to said second regenerative heat exchanger to direct exhaust from said gas fired topping heater to said second regenerative heat exchanger after passing through said first regenerative heat exchanger.

10. (amended) A system in accordance with Claim 9 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator through said second regenerative heat exchanger to said steam turbine to direct a portion of an output of said steam generator through said second regenerative heat exchanger and to said steam turbine and generator assembly.

11. (amended) A system in accordance with Claim 1 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator to said steam turbine to direct a portion of an output of said steam generator to said steam turbine and generator assembly to generate electricity.

25. (thrice amended) A system for generating hydrogen comprising:
feed water;
a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium;
a steam generator connected to said secondary heat loop, said heat transfer medium and said feed water passing through said steam generator, said steam generator capable of raising the temperature of said feed water to between about 450°C to about 550°C;
a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and
a topping heater, said topping heater capable of raising the temperature of said feed water so that said feed water in said high temperature water cracking system is at least about 850°C, said feed water input line coupled in flow communication with said steam generator, said

103 topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

Sub E4 28. (amended) A system in accordance with Claim 27 wherein a topping heater fuel comprises a portion of said oxygen and hydrogen disassociated from said feed water in said high temperature water cracking system.

104 29. (amended) A system in accordance with Claim 27 further comprising a first regenerative heat exchanger and a topping heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct exhaust from said gas fired topping heater into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

30. (amended) A system in accordance with Claim 29 further comprising a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to a desalination plant to direct exhaust from said gas fired topping heater said desalination plant after passing through said first regenerative heat exchanger.

31. (amended) A system in accordance with Claim 29 further comprising a second regenerative heat exchanger and a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to said second regenerative heat exchanger to direct exhaust from said gas fired topping heater to said second regenerative heat exchanger after passing through said first regenerative heat exchanger.